

RESEARCH AND INNOVATION SUBCOMMITTEE EXECUTIVE SUMMARY

The Research & Innovation Subcommittee (RIS) of the Strategic Planning Steering Committee (SPSC) was charged with completing an environmental scan to support Phase II of the university's strategic planning process. Recognizing that the SPSC had a separate subcommittee for teaching and learning, we limited our efforts to identifying institutions or characteristics that contribute to impactful research and innovation outside the context of teaching and learning and the culture, structures and environment that support those efforts.

In addition, the RIS was mindful that our environmental scan could be evaluated through a variety of lenses, including diversity and inclusion, resource needs and resource generation, global impact, technology, and sustainability. Although we did not categorize our findings explicitly with respect to those lenses, those concepts appear throughout the RIS' explorations and findings – some explicitly and others implicitly.

In our external scan, the RIS found that those institutions leading research and innovation efforts consistently have the following characteristics:

- A culture that allows for and promotes measured experimentation and risk-taking,
- Focused leadership that can bring together individual efforts and synergies,
- An environment that fosters pan-organizational thinking and avoids silos,
- Collaborations with industry partners, governmental entities, nonprofits, and other institutions of higher education,
- Differentiating areas of knowledge and expertise, and
- Infrastructure and support structures to facilitate the work.

Taking stock of W&M, we found repeated instances where our organizational structure and design, talent and culture, strategy and execution, use of physical spaces and technologies, and internal and external collaborations either facilitated or detracted from the university's R&I efforts. In some cases, we found inherent tensions where a characteristic was seen as both a strength and a weakness.

Overall, we heard four emerging themes to consider as we assess W&M's strategic position and as we look to build sustained strength in the areas of research and innovation in our next strategic plan:

1. Reducing silos will be essential to W&M's success;
2. Differentiating W&M from other institutions will be important;
3. Current infrastructure and administrative support structures are insufficient; and
4. Balancing teaching and learning with research and innovation will be challenging.

For W&M, it will be important to ensure not only that we address these issues by aligning them in a way that is consistent with W&M's unique attributes – notably, exceptional undergraduate research; a liberal arts and sciences perspective that can create important intersections between the sciences, engineering, technology, social sciences and the arts and humanities; and the ability to serve as a convener of thought leaders across a number of domains.

REPORT OF THE RESEARCH AND INNOVATION SUBCOMMITTEE

SUBCOMMITTEE CHARGE

The Research and Innovation Subcommittee (RIS) received the following charge: “Conduct a thorough external and internal environmental scan of the respective area of focus. External trends should be a primary focus of this work, framing internal structures and existing programming within the broader external trends” (October 3, 2019 memo from SPSC Chairs to Committee members).

OUR APPROACH

As part of this charge, members of the Strategic Planning Steering Committee (SPSC) assigned to the RIS were asked to identify three to five individuals within the William & Mary (“W&M”) community who could contribute to the subcommittee’s work. As a result, we added five members to the RIS. (See **Appendix A** for a list of all RIS members.) We were also asked to conduct at least 10 “outreach meetings” with relevant university constituencies as input to our work. We identified over 30 individuals, of which we were able to interview a total of 24, largely from within the W&M community, as shown in **Appendix B**. Finally, we were asked to identify national trends in the areas of research and innovation. (A compilation of the most pertinent articles and reports can be found in **Appendix C**.)

Framing Our Work

As an initial step, the RIS set out to define the parameters of its work, particularly in conducting its external scan. Much of the literature around research and innovation in higher education focuses on innovations in teaching and learning or advancements that are discipline specific. Recognizing that the SPSC had a separate subcommittee for teaching and learning, we limited our efforts to identifying institutions or characteristics that contribute to impactful research and innovation outside the context of teaching and learning and the culture, structures and environment that support those efforts.

To create some consistency, we used a standard set of questions during each of our interviews (see **Appendix D**). Typically, each interview was conducted by two RIS members with one member serving as the lead interviewer and the second member transcribing the interaction. The committee met on six separate occasions over the course of eight weeks to discuss and organize its findings. The RIS worked diligently to ensure that there was sufficient representation to get a reasonably full portrayal of W&M’s current strengths, weaknesses, opportunities, and threats. However, it will be important that the SPSC continues to validate our findings and seeks input as it moves into the final phase of strategic planning. We note specifically that the SPSC should seek broader input from the School of Education on the report of the RIS and pay deliberate attention to the similarities and differences inherent in research and innovation as well as the contributions that professional schools bring to bear in both spheres.

Distilling Our Findings

Several consistent themes emerged from our external scan. We found repeatedly that those institutions leading research and innovation efforts have the following characteristics:

- A culture that allows for and promotes measured experimentation and risk-taking,
- Focused leadership that can bring together individual efforts and synergies,

- An environment that fosters pan-organizational thinking and avoids silos,
- Collaborations with industry partners, governmental entities, nonprofits, and other institutions of higher education,
- Differentiating areas of knowledge and expertise, and
- Infrastructure and support structures to facilitate the work.

As we went through our interviews, similar themes emerged specific to W&M and its perceived strengths and weaknesses. We found repeated instances where our organizational structure and design, talent and culture, strategy and execution, use of physical spaces and technologies, and internal and external collaborations either facilitated or detracted from the university's R&I efforts. In some cases, we found inherent tensions where a characteristic was seen as both a strength and a weakness. (Additional detail on the SWOT Analyses can be found in **Appendices E-I** attached.)

Emerging Themes

Overall, we heard four emerging themes to consider as we assess W&M's strategic position and as we look to build sustained strength in the areas of research and innovation in our next strategic plan.

1. Reducing silos will be essential to W&M's success. Throughout its work, the RIS found examples of highly collaborative work already underway at W&M, including research at the Virginia Institute of Marine Science (VIMS), the Global Research Institute (GRI), the Omohondro Institute, Highland and the Lemon Project. Individuals attributed the success of these efforts to many of the positive aspects of W&M that inherently promote cross-disciplinary exchange of ideas and collaboration, including its relatively small size, collegial culture, and the multidisciplinary emphasis of liberal arts and sciences. Nonetheless, the RIS received overwhelming feedback that the current environment, culture, spaces and support structures at W&M: create isolation between individuals, departments and schools, and disciplines; limit innovative approaches; undermine potential teamwork; and result in missed interdisciplinary opportunities.

We heard repeated suggestions for W&M to: establish more university-wide symposia or ongoing forums to bring faculty and staff together around potential issues, challenges or research interests; create internal funding opportunities that target cross-departmental or cross-school teams without added bureaucracy; employ technology to inform faculty members about others' research initiatives that may intersect with their individual area(s) of expertise; and develop collaborative spaces for more university-wide interaction. More broadly, the subcommittee identified the lack of a convening and coordinating entity (e.g., a research & innovation hub or institute) lacking at W&M. Many institutions have such an entity with the explicit objective to foster and facilitate university-wide information dissemination and collaborative efforts in research and innovation.

2. Differentiating W&M from other institutions will be important. Through both the external scan and our interviews, the RIS repeatedly heard that W&M should build on its strengths and differentiate itself from other leading universities in research and innovation. Specifically, we heard that W&M should: maintain its commitment to strong student research; build on our tradition of liberal arts and sciences and leverage our professional schools; and expand our work to include regional, state, national, and global partners. We address each of these in turn.

- ***Leveraging Student Research.*** W&M is a national leader in involving undergraduates in faculty research. Across-the-board, those we interviewed felt that W&M should continue to focus on this strength moving forward, both as a way to support faculty research and innovation and as a way to continue enhancing our external brand. Teaching, learning and research are widely integrated at W&M and recognized to be mutually beneficial. Undergraduate student research notably adds to positive student-faculty interactions. In addition, many faculty engage deeply with our professional students in research. W&M students, at all levels, are given a remarkable range of research opportunities and freedom to choose the area of research in which they would like to participate. Unlike some research universities, undergraduates, in particular, are vital contributors to cutting edge faculty R&I across many parts of W&M. Some suggested that W&M should look to teach undergraduates more about the research process; simplify and standardize paths to involve undergraduates and professional students in faculty-led research; and further expand undergraduate research opportunities, especially for first-generation college students and others less likely to engage in research.
 - ***Building on our liberal arts and sciences tradition.*** Several interviewees noted that because of its size, W&M should not attempt to excel in as many areas of R&I as a much larger university. Given its current portfolio, there are notable areas in which W&M can reach a critical mass, be widely recognized as a R&I leader and build on its inherent advantages. Examples of existing or emerging areas of excellence at W&M that were raised in our interviews include (in alphabetical order and NOT comprehensive): business innovation, coastal and estuarine science, data sciences, early American history, high-performance computing, international policy analysis, nuclear and hadronic physics, and technology in administration of justice. These examples tend to be interdisciplinary and/or leverage our geography, sensibly utilizing our existing strengths. The RIS and many of those we interviewed indicated that W&M has the opportunity to build on its under-recognized strength in the natural sciences and expand into technical fields (e.g., engineering), while bringing a “liberal arts perspective” to work in all domains. Interviewees repeatedly emphasized the integration of humanities & sciences as well as the expertise of our professional programs as two of W&M’s greatest assets. Success in R&I undoubtedly benefits from exposure to diverse thinking and problem-solving skills, not simply from practiced prowess in a specialized area.
 - ***Developing stronger partnerships.*** Many of those we interviewed identified opportunities to leverage W&M’s work to address regional, state, national and even global issues. Potential regional partners identified included: NASA Langley, Jefferson Labs, state government in Richmond, defense industries in Hampton Roads, and Virginia’s historically black colleges and universities. In addition, many of those interviewed noted that W&M currently lacks strong corporate and business partnerships in the region and beyond.
- 3. Current infrastructure and administrative support structures are insufficient.** Throughout its work, the RIS perceived a mismatch between existing administrative structures and support at W&M and those that would provide the flexibility needed to excel in R&I. W&M has a long established and highly successful record in promoting excellence in teaching. However, structures built to serve more slowly evolving, generally-funded instructional support may dampen rapid-response elsewhere. The RIS identified limitations in our human resources policies and procedures, pre- and post-grant administration, internal funding mechanisms, communication vehicles, administrative software,

graduate student and research staffing, incentive structures, and evaluation priorities. We heard repeated examples that require more in-depth review. A few key examples stood out:

- ***Hiring Practices and Career Incentives.*** W&M currently requires extended, faculty-like searches to fill research postdoctoral positions and research assistants. The search process tends to be drawn-out with time-consuming upper-level administrative reviews. The extended search process does not meet the needs of short-term, grant-funded staff hires that often must be made quickly due to funding schedules. And once here, there are few professional paths to maintain quality researchers who are not in tenure track faculty positions. Other universities have senior research scientist positions and hybrid funding models that allow blending of hard dollars from the university with soft money from grants and contracts. More/better research requires more flexibility in these domains.
- ***Pre- and post-award administration.*** W&M faculty pursue extramural funding across a myriad of sponsors, comparable to many larger research institutions. However, the volume of proposals for each potential sponsor is often lower due to W&M's size and research activity. As a result, W&M's staff often are expected to develop and maintain expertise specific to a wide array of sponsors and corporate partners even though W&M may only have a limited number of grants or gifts funded (or under consideration) by those entities. Analogously, W&M departments and schools are less likely to have staff trained in proposal preparation and post-award management given relatively small research portfolios. As a result, individual W&M faculty and staff likely spend more time per dollar raised struggling to understand and comply with funding regulations and requirements compared with their external colleagues. Interviewees felt that a campus-wide R&I hub might help faculty, R&I support staff, and other W&M administrative groups to find solutions to more effectively pursue and manage proposals and awards.
- ***Communicating Opportunities.*** In a number of discussions, the lack of an internal and external communications structure and/or strategy emerged. For instance, we heard numerous accounts of missed opportunities to bring faculty together in an interdisciplinary way in addressing an issue or challenge. Many lamented that even with our relatively small size, it is difficult to know what others are doing in different departments or areas across campus. Likewise, for those involved in various innovation and entrepreneurship efforts, it is difficult to collaborate in our current environment given the lack of an integrated organizing body.
- ***Counting, measuring and evaluating.*** We heard a repeated theme around not having systems or structures in place to support the work of R&I. From an administrative standpoint, we are relying on outdated and often home-grown systems to manage and measure our activity and success. Faculty expressed concerns that workload assignments, availability of release time, departmental criteria for promotion and tenure created barriers to collaborations and interdisciplinary work in R&I.

4. Balancing teaching and learning with research and innovation will be challenging. The RIS and several of those interviewed recognized that many faculty already feel overwhelmed by the current pressures to publish, raise external funds, shepherd hands-on student research, and maintain high teaching standards, particularly in an environment with limited staff support. Faculty feel they do not have time to develop creative multidisciplinary proposals, pursue innovative industrial collaborations, or otherwise experiment with changes in the way they do scholarship – and that promotion and tenure requirements, departmental expectations, and other university structures do not place a high value on those activities.

In that same vein, the RIS also heard that although there is a strong desire to maintain undergraduate research among those interviewed, current faculty workload assignments and evaluation metrics do not adequately reflect the time commitment required to support this effort. In other words, faculty commitment to quality undergraduate research is not recognized or rewarded adequately.

The RIS questioned how faculty in leading public research universities, who have similar teaching loads, find time to pursue these activities and generate external funding at higher levels than many at W&M. The RIS made two observations: 1) universities with more robust graduate level programs have graduate students who can assist them with other activities outside of their teaching, such as classroom and/or lab setup, grading, managing undergraduate research, navigating research proposal logistics, purchasing, and/or other functions, and 2) those institutions often have more skilled staff with specialized knowledge or training in administrative support functions.

How W&M chooses to address workload issues and the balance of faculty and staff time to meet its respective goals in teaching, learning, research and innovation extends beyond the charge of the RIS. However, the subcommittee noted that by expanding graduate programs, the university might be able to extend faculty time through the strategic use of graduate students as teaching assistants and research assistants and attract more postdocs and research staff that could alleviate some of the strain currently felt by W&M faculty trying to manage workload demands. In addition, as the SPSC begins to craft specific recommendations for the strategic plan, the RIS recommends that it consider developing an internal consulting capability to support our current and future R&I initiatives. This support could address the full spectrum of new initiative exploration, ideation, and development through evaluating potential improved efficiencies and delivery of existing initiatives and services. In addition to fostering strategic growth, this resource could also redress bottlenecks that reduce effective time management among faculty and staff.

W&M'S STRATEGIC POSITION

As the university considers how best to position W&M in the domains of research and innovation, our work has shown that leading institutions have:

1. A clearly defined strategy that was well-communicated and well-executed;
2. An organizational structure that promotes collaborations;
3. Incentives that both reward success, but also create the opportunity to learn from failure;
4. Physical spaces and technology tools to support collaborative work in these areas; and
5. Well-developed collaborations across the university and with strategic partners outside of the university.

For W&M, it will be important to ensure not only that we have these elements in place, but to align them in a way that is consistent with W&M's unique attributes – notably, exceptional undergraduate research; a liberal arts and sciences perspective that can create important intersections between the sciences, engineering, technology, social sciences and the arts and humanities; and the ability to serve as a convener of thought leaders across a number of domains.

Appendix A – Research & Innovation Subcommittee Membership

Carl Friedrichs, Co-Chair, Faculty, Marine Science
Amy Sebring, Co-Chair, Vice President for Finance and Technology
Layla Abi-Falah, Graduate Student, Law
David Armstrong, Faculty, Physics
Sara Belmont,* Staff, W&M Libraries
Dan Cristol,* Faculty, Biology
Dave Douglas, Dean, Law School
Mike Foradas, member, W&M Foundation Board of Trustees
Lynne Fors*, Staff, W&M Libraries
Roz Hargraves, W&M ACE Fellow
Rajiv Kohli, Faculty, Business
Michael Luchs*, Faculty, Business
Dan Parker*, Faculty, English
Mike Tierney, Faculty, Government
Peggy Agouris, Ex-Officio, Provost

* Members added in addition to those serving on the Strategic Planning Steering Committee.

Appendix B – Research & Innovation Subcommittee Interviews

Julie Agnew, Business Faculty
Kristy Borda, Science Librarian, W&M Libraries
Katherine Davis-Small, Director of Sponsored Programs
Melanie Dawson, English Faculty
Christopher Del Negro, Co-Chair, Engineering Physics & Applied Design Track and Professor of Applied Science
Georgie Donovan, Associate Dean for Collections and Content Services, W&M Libraries
Troy Hartley, VIMS Research Professor and Director of the Virginia Sea Grant Program
Graham Henshaw, Director, Alan B. Miller Entrepreneurship Center, Clinical Professor of Business
Jane Horvath, Senior Director of Global Privacy at Apple
Fred Lederer, Law Faculty and Director of Center for Legal and Court Technology
Dennis Manos, Vice Provost for Research, Graduate, and Professional Studies and Professor of Physics
Paul Mapp, History Faculty and Director of Graduate Studies
Deborah Morse, English Faculty
Luiza Newlin-Lukowicz, Senior Director of Corporate and Foundation Relations, University Advancement
Irena Novikova, Co-Chair of Engineering Physics and Applied Design Track and Professor of Physics
Brad Parks, Executive Director of AidData
Corinne Picataggi, Chief Technology Officer, W&M IT
Dan Runfolo, Applied Science Faculty
Jamie Settles, Government Faculty
Marian Taliaferro, Digital Scholarship Librarian, W&M Libraries
Chet Thaker, CEO of TeleBright Software Corporation
Virginia Torczon, Dean of Graduate Studies & Research, Computer Science Faculty
Peter Vishton, Program Director, National Science Foundation
Calandra Lake Waters, Director of Sustainability

Appendix C – Relevant Articles

About us | Research & Innovation. (n.d.). Retrieved from University of Colorado Boulder:

<https://www.colorado.edu/researchinnovation/about>

Blumenstyk, G., & Gardner, L. (2019). *The innovation imperative: the buzz, the barriers, and what real change looks like*. Washington, D.C.: The Chronicle of Higher Education. Retrieved from The Chronicle of Higher Education.

Bordoloi, L. M., & Winebrake, J. J. (2015, April 27). *Bringing the liberal arts to engineering education*. Retrieved from The Chronicle of Higher Education: <https://www.chronicle.com/article/Bringing-the-Liberal-Arts-to/229671>

Colorado College. (n.d.). Originality transforms: supporting innovation at Colorado College. Colorado Springs, CO.

Committee on Creativity, Innovation, and Entrepreneurship. (n.d.). *CIE at UR: findings and recommendations*. Retrieved from Office of the Provost, University of Richmond: <https://provost.richmond.edu/academic-initiatives/pdf/CIE%20Findings%20and%20Recommendations.pdf>

Develop your proposal. (n.d.). Retrieved from Princeton University: <https://research.princeton.edu/funding/develop-your-proposal>

Funding proposal process. (n.d.). Retrieved from Princeton University: <https://cefr.princeton.edu/faculty/proposal-development>

Goins, E. (2017, September 15). *Why I'm leaving a research [one] university for a liberal arts college*. Retrieved from AMS: American Mathematical Society: <https://blogs.ams.org/inclusionexclusion/2017/09/15/why-im-leaving-a-research-i-university-for-a-liberal-arts-college/>

Jahanian, F. (2018, January 17). *4 ways universities are driving innovation*. Retrieved from World Economic Forum: <https://www.weforum.org/agenda/2018/01/4-ways-universities-are-driving-innovation/>

Lapovsky, L. (2017, July 4). *How to keep your college financially healthy today: success vs. failure*. Retrieved from Forbes: <https://www.forbes.com/sites/lucielapovsky/2017/07/04/how-to-keep-your-college-financially-healthy-today-success-vs-failure/#50d3b02e5cee>

Marcus, J. (2020, January 17). *Think universities are making lots of money from inventions? Think again*. Retrieved from The Hechinger Report: <https://hechingerreport.org/think-universities-are-making-lots-of-money-from-inventions-think-again/>

McClain, J. (2018, September 18). *Dan Cristol has an audacious goal for undergraduate research at W&M*. Retrieved from <https://www.wm.edu/news/stories/2018/dan-cristol-has-an-audacious-goal-for-undergraduate-research-at-wm.php>

Murphy, M. (2016, August 17). *Summer in the sandbox*. Retrieved from MIT News: news.mit.edu/2016/summer-sandbox-0817

Proposal development. (n.d.). Retrieved from Princeton University: <https://orpa.princeton.edu/sponsored-research-lifecycle/proposal-development>

Proposal Writing Support. (n.d.). Retrieved from University of Colorado Boulder: <https://www.colorado.edu/researchinnovation/research-development/proposal-development/proposal-writing-support>

Selingo, J. J. (2018). *The rise of the chief innovation officer in higher education: the importance of managing change on campuses*. <https://info.entangled.solutions/the-rise-of-the-chief-innovation-officer-in-higher-education/>.

Siliezar, J. (2019, September 20). *A link across campus*. Retrieved from Harvard Gazette: <https://news.harvard.edu/gazette/story/2019/09/harvard-launches-database-to-help-community-connect-across-disciplines/>

Simon, A., & Simon, A. (2019, April 10). *Who are the successful innovators in higher education?* Retrieved from SAMC: Simon Associated Management Consultants: <https://blog.simonassociates.net/who-are-the-successful-innovators-in-higher-education>

Support for large, collaborative federal proposals. (n.d.). Retrieved from Princeton University: <https://research.princeton.edu/funding/develop-your-proposal/support-for-complex-federal-grants>

Wisnioski, M., & Vinsel, L. (2019, June 11). *The campus innovation myth: a half-century of occasional breakthroughs-and many disappointments*. Retrieved from The Chronicle of Higher Education: <https://www.chronicle.com/interactives/20190611-vinsel>

Appendix D – Research & Innovation Subcommittee Interview Questions

- 1) What do you see as W&M strengths in the areas of research and innovation?
- 2) Where do you see opportunity for W&M to expand on existing strengths?
- 3) Are there existing barriers that limit W&M's ability to maximize its efforts in these areas?
- 4) What areas do you think W&M needs to enhance in order to position itself strategically in the coming decade?
- 5) In your field, who are the leading higher education institutions?
- 6) What do you see as potential risks in this space?
- 7) What entities (e.g., other higher education institutions, governmental agencies, non-profits or corporations) do you see as potential partners for W&M in the area of research and innovation?
- 8) How should we think about and measure success in these domains?
- 9) What else should we be thinking about that we haven't already discussed?

Appendix E - Collaborations SWOT Transcription

Text in black is from interviews; text in red is from the articles.

Strengths

- Strong existing external collaborations
 - Collaborations with federal agencies in the social sciences (US Aid, Department of Defense, etc.)
 - Trusted partner with federal agencies
- Strong existing internal collaborations
 - VIMS and GRI collaborate across disciplines
 - Cyber technology (law and business)

Weakness

- Communication
 - W&M is too siloed, limiting success
 - Need to know more about what others are doing to be interdisciplinary
 - Silos limit our success
 - Communication (internal and external) is poor/insufficient
 - Inability to build large multi-disciplinarian teams is a weakness
- Lack of publicity
 - Increase publicity on what research is being done on campus
 - Central contact portal for outsiders to learn about W&M R&I
- Lack of business connections
 - Need more corporate philanthropy, including as research sponsors
 - Corporate philanthropy as research sponsors
 - Reach out to more local businesses and HBCUs in VA to partner and share resources
 - We lack collaborations with local business
 - More research sponsored by companies. Companies like assoc. with positive univ. reputation
- Lack of incentives
 - Add collaboration as metric to tenure
 - Limited rewards currently for interdisciplinary work
- Lack of faculty symposium
 - Host conference here with people from different disciplines
 - Conference(s) to promote faculty-faculty collaboration at other universities
 - Need to put W&M on the map by inviting rising stars and hotshots here
 - More university-wide symposia

Opportunities

- Internal collaborations
 - Research on climate change given VIMS and our location
 - Partner with St. Andrews on STEM / neuroscience
 - In-house consulting ventures
 - More connections between schools

- Opportunities to collaborate across humanities and science
- Need more interschool collaboration
- Faculty and student social opportunities encourages new ideas
- We do not have a way to disseminate internal knowledge about what's going on
- Unique location
 - Great location for external collaborations (i.e., DC)
 - Don't skip Richmond in rush to DC
 - W&M as a research facilitator, organizer, leader across Virginia
 - CoLAB – generalist tech credential created by some VA schools (VCU, Tech, U of R...)
- Industry
 - Leverage connections with NASA, Colonial Williamsburg, Jamestown
 - We need to build better connections with military, NASA and DC
 - Collaboration with Colonial Williamsburg , Yorktown, Jamestown
 - Immersive partnerships provide an opportunity
 - Corporate philanthropy as an opportunity
 - More collaboration with the private sector
 - Growth in industry funding for university research
 - Need more external partners such as Department of Defense, or medical fields
 - Utilize space in new ways, especially renting to potential commercial/industry partners
 - Need more collaboration with industry
- Other universities
 - Opportunity to collaborate beyond W&M
 - Multi-institution research grants
 - Provide support to HBCUs & other higher education institutions with fewer resources
 - Collaborations with area universities to share ideas, resources, courses
- Funding
 - Summer funding and innovation spaces promote student-led research and innovation
 - Interdisciplinary funding
 - Pursue more grants (and support this)
- Humanistic understanding
 - Interdisciplinary work on cyber initiatives
 - Programs to study the humanitarian aspects of sustainability
 - Apply W&M strength in civil rights / ethics / privacy and data protection / cyber security

Threats

- Corporate-driven teaching
 - Corporate or foundation collaborations can hurt undergraduate research/teaching
 - Should universities act as corporate training programs
 - Innovation partnerships with business world often costly failure: higher risk
 - Top-down decision making driven by external partner(s)
- Cost
 - Many research activities do not make money
 - Tech transfer offices often (87%) lose money
- Reputation

- W&M reputation is not well known for research
- Can be a leader in working on real world problems

Appendix F - Physical Spaces / Tech SWOT Transcription

Text in black is from interviews; text in red is from the articles.

Strengths

- Co-location synergies
 - Locating department in same building fosters collaboration (i.e. ISC)
- Access to resources like Cyclone, Cloudera, seed funding
- Quality of infrastructure
 - Physical plant/recent investments have upped our game
- Geographical strength
 - Location to DC and Richmond is an asset

Weakness

- Siloed inefficiency
 - Campus geography and siloed schools limit connectivity and create isolated academic subgroups
 - Separation of VIMS from W&M campus
- Lack of innov. spaces
 - Behind on modern tech
 - Lack of makerspaces and collaborative spaces

Opportunities

- Innovation institute / hub
 - Infrastructure to support open source software and experimentation with software
 - Infrastructure to support networks and experimentation on campus (more openness)
 - Suite of things to try out in classrooms (apps, gaming, tech, etc.)
 - Space for developing skills (e.g. data science) -> learning lab in library
 - Create sandbox for trying new ideas outside usual governance structure
 - Summer sandbox funding and collaboration space
- Signature spaces
 - World class auditorium for signature events
- Data analysis to inform decisions
 - Better use of technology to inform what we are doing / identify synergies
- Alternative places to gather
 - Large faculty lounge/café to encourage development of networks/collaborations
 - Create new venues for faculty across disciplines to interact

Threats

- How buildings funded
 - Reductions in state support to universities

Appendix G - Org Structures/Design SWOT Transcription

Text in black is from interviews; text in red is from the articles.

Strengths

- Smaller/Less siloed
 - Discip. Boundaries low compared to peer inst. (less siloed)
 - Departments not that siloed
 - W&M's size is a strength
 - COLL curriculum has fostered collaboration
- Program portfolio
 - We have the right mix of graduate and undergraduate programs
- Departmental autonomy
 - High degree of departmental autonomy
- Some process/admin strengths
 - IRB that is reasonable and efficient

Weaknesses

- Silos
 - Too many silos—w need better visibility/discussion across schools and programs
 - Silos: faculty find it difficult to form teams
 - Sciences are embedded in A&S
 - Isolation of professors, departments, and research groups from one another
 - No diversity of thought because no interaction with other depts.
 - Universities tend to have rigid structures adverse to change
- Absence of key university building blocks
 - Lack of engineering & medical schools
 - Lack of Ph.D. programs
 - Lack of health sci limits our options
 - No engineering limits us
- State limitations
 - Requirement to take so many in-state students limits strength and diversity of students
- Funding/resources
 - We lack funding to encourage exploration
 - Funding limitations are a weakness
 - \$ for interdisciplinary work
 - Low faculty:student ratio threatens ability to focus on R&I
 - Inst. Structures w/low capacity, eg. P&T, CFR
 - Investing in PhD programs is expensive
 - Stress/fatigue from finding funding for basic salaries
 - Staffing too low in Charles Center
 - More diverse student bodies need more financial aid

- Lack of innovative funding mechanisms; M³, UVAC³
- Bureaucracy and lack of processes
 - Over centralization kills innovation
 - HR bureaucracy
 - Lack of HR flexibility
 - HR & personnel policies
 - Limited structures/process to encourage innovative thinking
 - Bureaucracy and fundraising
 - Bureaucracy is large. Regulations increasing rapidly
 - Staffing needs to be increased to make research approvals more streamlined and efficient
 - Decreasing faculty involvement in governance
 - **Top down reforms risk lack of uptake**
 - Top researchers are being quashed by high transactional costs
 - Policies unclear for postdocs, visiting scholars, etc...
 - Bureaucracy is a roadblock to innovation
 - Compliance takes too long—done by faculty
 - Transaction costs are high (eg. Bureaucracy—Reveley Fellows)
- Limited mission scope
 - Our structure mainly supports teaching, not research
 - Tendency to focus on grads vs. undergrad

Opportunities

- Expand/add academic programs
 - EPAD -> expand
 - Expand engineering a la EPAD
 - More neuroscience (NIH!)
 - Data Science -> expand
 - Lack of grad programs is a limitation in recruiting faculty talent
 - Expanding doctoral programs will provide more research opportunities for undergrads
 - PhD programs in select areas (Chem, Bio, Psych)
 - More professional masters
 - More engineering-like programs w/strong lib arts connection
 - **Majority of students would like some courses online**
 - **Expand graduate research programs**
 - **Create programs that integrate sciences and humanities**
 - **Need for humanities based skills: ethics, policy, sociology**
- Matrix organization
 - Data science could break down silos, if not located in single dept
 - Interdisc. teams are strong
 - Integrate VIMS with campus researchers
- Innovation institute

- Integrate innovation under a chief innovation officer
- A formalized innovation institute to lead, support, facilitate innovation
- W&M internal consulting group to support innovation of academics and university operations
- Create org structure to coordinate and integrate innovation efforts across campus
- Provide a clear gateway/entry point for potential external partners
- Identify an innovation institute as focal fundraising opportunity
- Central “research registry” to identify, track measure success of R&I
- Innovation-in-residence program
- A CIO can unite research and innovate projects across campus
- An innovation center to forge partnerships (internal and external)
- Support project initiation
 - Fellowships to free faculty to focus on innovation project for startup
 - Expand staff and \$ support for pursuing grants

Threats

- Losing discipline rigor
 - Treating all departments the same when they have different needs and opportunities
 - Losing discipline-specific depth given pressure to be more interdisciplinary
 - Negative perception that more PhDs will take away from undergrad
 - Bias in Chemistry & Biology against PhD programs
 - Starting Ph.D. programs might harm existing Master’s programs
- Treating interdisc. as single disciplines
 - Danger of siloing integrative methods like data science
 - Don’t put sustainability initiative in its own silo. Build it into all we do
 - We don’t leverage interdisc. as much as we could
- Unintended incentive consequences
 - Building incentives re: tenure about monetization of research

Appendix H - Strategy & Execution SWOT Transcription

Text in black is from interviews; text in red is from the articles.

Strengths

- Do we do this yet?
 - Fostering culture of entrepreneurship
- Units/Centers
 - VIMS and GRI are a strength
 - Strength of American history program
 - Tech innov[ation]; e.g. “Center for Legal Court Technologies”
 - D&I projects like the Lemon Project and Highland are a strength

Weaknesses

- Merit/Reward System
 - Few incentives to innovate b/c of faculty eval merit system
 - Faculty eval methods do no incentive interdisciplinary work
 - Concerns that high risk experiment[ation] will not be rewarded in context of tenure/promotion
 - Recognition of faculty who research with undergrads (inconsistent)
 - We need more positive incentives for faculty to explore new (risky) ideas
- Internal Bureaucracy
 - Policies and procedures regarding compliance change too quickly
 - We lack flexibility in HR policies to foster interdisciplinary connections
 - Inst Process a weakness (rigidity), e.g. P&I
- Career prep for students
 - Prepare students for careers (not well done)
- Tracking of/Goals for
 - Lack of clear goals about why we do research, and for whom, what purpose
 - Lack of clarity and transparency about goals of research (knowledge vs. revenue)
 - Continually identifying what is new within specific academic disciplines
 - We need guidance on how to learn from failures
 - Limited research info sources (Web of Science, Scopus)
 - We need better software to track proposals, grants, and contracts[?] across programs
- Sustainability
 - No strong focus on sustainability
- Uneven effort
 - Some fields make less effort to involve undergraduate students in research

Opportunities

- Promoting ourselves better
 - Alt metrics as another way to measure research impact
 - Distribute humanities research results using social media such as podcasts

- Promote our research better with press coverage
- Track global impact of research and teaching
- Better tracking of research
- Better recognition for work we are already doing
- Publishing in OA [open access] journals would increase university impact
- Making research relevant
 - Solving real world problems will generate positive attention
 - Identify broad, focal research themes for W&M to champion/coordinate
- More efficient practices
 - Universities must increase operational efficiencies
 - Reduce excess administrative layers and administrators
 - Outsource non-mission central functions to save \$\$
 - Room to further streamline biz practices
- Support staff for grants
 - Dedicated grant writers to help faculty?
 - Library can help with grant writing
 - Lack of support staff for researchers
 - Need more time to write proposals, mini-sabbaticals
 - Insufficient support staff to enhance faculty efforts
 - More admin support for grant apps
 - We need more capacity in corporate and foundation relations
 - Need more staff support for research duties, e.g. animal care

Threats

- Cost: impact on what we do
 - Build on existing strengths. Don't reinvent the wheel.
 - Startup costs and OH are costly
 - Risk of crowded market
 - Operating expense growth outpacing revenue growth
- External bureaucracy
 - State laws, accreditors impede experimentation
 - SCHEV makes it hard to innovate and adapt
- Poor decision making
 - Danger of making decisions w/o quality mkt study
 - Letting innovation be driven by outside forces (corporations, hi-tech companies)
- Risk of failure
 - Some changes will be failures
 - Faculty may burn out if too many failures from risky investments
 - Without a history/culture of entrep. thinking, failure is a risk
 - Perception of failure if school deviates from historical path
 - Skepticism due to past initiatives overpromising and under delivering; Innovation fatigue
 - First do no harm—things are working well, be careful

- Risk of status quo
 - Risk in doing nothing/status quo
 - **Doing nothing will guarantee failure**

Appendix I - Talent & Culture SWOT Transcription

Text in black is from interviews; text in red is from the articles.

Strengths

- Great students, integrated into research
 - Students want to work
 - Undergrads are involved in graduate school research
 - Our strength is our student research
 - National leader in undergraduate research
 - W&M has outstanding students, both graduate and undergraduate
 - Student body/undergraduate research is a strength
 - Students are free to define their own research topics
 - Students integrated into research work
 - W&M really integrates teaching & research
 - Undergraduate students are involved in research
 - W&M students add value to R&I
 - Undergrad research – W&M national leader
 - Great students (and our brand that draws them to us)
- Great faculty, student/faculty interactions
 - People are our strength – faculty & students
 - Close student-faculty culture
 - Have excellent faculty
 - Highly engaged faculty
- Culture of excellence, generosity
 - Commitment to quality for its own sake
 - W&M has a challenging intellectual environment
 - Our commitment to quality over quantity is high
 - W&M has a culture of high quality in all work
 - Collegiality
- R&I strength in specific fields
 - Physics is strong in research and nationally known
 - History department - PhD in American history strong
 - Data science program is a model for interdisciplinary research
 - VIMS, AidData and Center for Legal Court Technologies are world-class programs
 - W&M has expertise in niche fields (eg AidData & VIMS)
 - VIMS is strong, but not well integrated
 - Leader in courtroom technology
 - Omohundro commitment to innovation
- Strength of leveraging liberal arts

- Liberal arts skills & multidisciplinary exposure are useful in most professional careers
 - Liberal arts is a strength
- W&M has loyal alumni

Weakness

- Limited faculty time
 - Faculty do not have time to develop creative multidisciplinary proposals
 - Insufficient faculty balance re: TTE/NTE, junior/senior, intra/inter-disciplinary types of research
 - Do we have time to or like spending time with undergrads outside classroom
 - Faculty too busy to write complex proposals
 - Faculty time is limited due to curricular and service requirements
 - Time consumption of self-funding
- Lack of PhD students and postdocs
 - Small number of good programs is a weakness
 - We need more postdocs to produce more/better research
 - Increase number of postdocs and senior research scientists in non-PhD programs
 - Bias against PhDs in some science departments
 - High burnout – need postdocs to help senior people do research
- Low volume of research
 - Need to submit more grant proposals
- Student timeline
 - Annual skill loss when students graduate
- Culture misaligned
 - W&M is too traditional, slow – not agile
 - Pushback from upset college constituencies in response to change
 - Unwillingness of W&M leadership to protect risk takers who fail
 - W&M is inward looking / not innovative
 - Academic culture is risk-averse
 - Fear of change

Opportunities

- Add graduate programs, research programs
 - Add more doctoral programs
 - Add faculty in growing fields: health science, business, engineering for example
 - Pick 2 or 3 big research goals – we can't be or measure everything
 - Research opportunities in resilience, sustainability and societal changes
 - Research in social sciences poised to gain recognition
- Promote openness & collaboration across liberal arts – engineering
 - Desire for cross-disciplinary collaborations
 - Incentives for more intra-discipline groups and work
 - More promotion / open access of research
 - Promote openness more fully (publish syllabi, open-access research, more public engagement)
 - Encourage more collaboration

- Combine engineering and liberal arts
- Promote improved culture
 - Create more diversity & inclusion in the workplace
 - How change is communicated – “innovation” = doing more with less
 - Leadership should create culture of innovation
 - Encourage and enable more bottom up ideas (e.g. from students & NTEs)
 - Change mindset to be more playful and take more risk
 - Encourage lots of small, incremental low risk projects (vs. “big bets”)
- Hiring, bring in experts, flexible work arrangements
 - Enhance hiring to attract best candidates
 - Attract high profile humanities faculty stars
 - More flexible job arrangements
 - Program to bring in experts-in-residence (innovation fellows)
- More undergraduate research
 - Teach undergrads more about the research process
 - More emphasis on student advising
 - New initiative to streamline, simplify and standardize undergraduate research
 - Increase number of undergrad researchers at W&M
 - Quantify level of undergrad research
 - Expose more undergraduates to research opportunities
 - Make undergraduate research a student recruiting selling point
 - Simplify and standardize paths for students seeking undergraduate research
 - More research options for undergrads (beyond honors thesis)

Threats

- Losing “special sauce”
 - Danger of losing collaborative culture as we grow
 - Danger of straying from university mission
- Identity crisis
 - W&M does not have a strong reputation as a research university
 - W&M’s identity crisis – are we a research or a teaching institution? Can we be both?
- External interest not aligned with W&M strength
 - Pressure to back off liberal arts approach like other universities are doing
 - Few major grants
 - Decreasing national interest in humanities research
 - The future will have fewer 18-year olds
- Faculty angst
 - Lack of incentives to collaborate
 - Suspicion over joint appointments
 - Brain drain will impact graduate and undergraduate programs
 - Growing adversarial relationship between faculty and administration
 - Lack of support for faculty / burnout
 - Metrics used to measure success – needs to be more than publications and citations
 - Beware unintended consequences of simply promoting journal publications
 - Faculty may not want to do more undergraduate research than they are doing

- Teaching can become a form of punishment as research is stressed
- Undergraduate student focus
 - W&M needs to commit to graduate education
 - Post docs won't come here because of culture/policies